

What is claimed is:

1. A time simulation method of determining service availability of communications networks having a plurality of nodes and a plurality of links, comprising steps of:
 - (a) selecting a link between two network nodes;
 - (b) performing a simulated link failure on the selected link;
 - (c) selecting a connection between two network source and sink nodes;
 - 10 (d) determining the unavailability and availability of the connection under the simulated link failure condition;
 - (e) repeating steps (c), and (a) and (b); and
 - (f) summing the unavailability and availability of connections after each repetition until a predetermined number of all (or a decided subset of) connections have been selected, and either until a simulated link failure has been performed on all links or until the summed unavailability and availability has been determined to converge, whichever is earlier.
- 15 2. The time simulation method according to claim 1, further comprising steps of:
 - 20 averaging the service availability across all connections to generate the service availability of the network.
3. The time simulation method according to claim 1, wherein:
 - 25 all the above steps are performed in response to clock increments, which proportionately correspond to actual times.
4. The time simulation method according to claim 1, wherein the network has corresponding nodes and links, the links having attributes in relation to their characteristics with respect to simulated failures, recovery and repair processes.
 - 30 the method further comprising a step of:
 - randomly selecting a link based on the attributes of the links.

5. The time simulation method according to claim 4, wherein the attributes are in relation to their distance, time-to-failure parameter (hereinafter called TTF), and time-to-recover/repair (hereinafter called TTR).

- 5 6. A time simulation apparatus for determining service availability of mesh or other communication networks, comprising:
- a network having a plurality of nodes and a plurality of links; the links having attributes relating to their characteristics with respect to simulated failure, recovery and repair mechanisms;
- 10 a mechanism for selecting connections between source and sink nodes;
- a failure/recovery module for performing a simulated failure and recovery of the selected link; a mechanism for selecting a connector between source and sink nodes; and
- an arithmetic mechanism for calculating availability of the selected connection.
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7. The time simulation apparatus according to claim 6, further comprising:
- an averaging module for averaging the availability of connection for all possible connections in the network to generate the service availability of the network.
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8. The time simulation apparatus according to claim 6, further comprising a clock for generating clock increments calibrated to correspond to a specific realtime interval.
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9. The time simulation apparatus according to claim 6, wherein the network has corresponding nodes and links, the links have attributes in relation to their characteristics with respect to simulated failures, recovery and repair processes.
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10. The time simulation apparatus according to claim 9, the apparatus further comprising a mechanism for randomly selecting a link based on the attributes of the links.

11. The time simulation apparatus according to claim 10, wherein the attributes are in relation to their distance.

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